

This Page Is Inserted by IFW Operations
and is not a part of the Official Record

BEST AVAILABLE IMAGES

Defective images within this document are accurate representations of the original documents submitted by the applicant.

Defects in the images may include (but are not limited to):

- BLACK BORDERS
- TEXT CUT OFF AT TOP, BOTTOM OR SIDES
- FADED TEXT
- ILLEGIBLE TEXT
- SKEWED/SLANTED IMAGES
- COLORED PHOTOS
- BLACK OR VERY BLACK AND WHITE DARK PHOTOS
- GRAY SCALE DOCUMENTS

IMAGES ARE BEST AVAILABLE COPY.

**As rescanning documents *will not* correct images,
please do not report the images to the
Image Problem Mailbox.**



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/074,141	02/11/2002	Rajeev Bajaj	AMAT/6228/CPI/ECP/PJS	6612

32588 7590 10/07/2003

APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER

WONG, EDNA

ART UNIT	PAPER NUMBER
----------	--------------

1753

DATE MAILED: 10/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/074,141

Applicant(s)

BAJAJ ET AL.

Examiner

Edna Wong

Art Unit

1753

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 15 September 2003.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1,4-14,16-24 and 26-34 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1,4-7,10-14,20-24,28,29 and 31-33 is/are rejected.
- 7) ☒ Claim(s) 8,9,16-19,26,27,30 and 34 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other: _____

This is in response to the Amendment dated September 15, 2003. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

Response to Arguments

Claim Rejections - 35 USC § 112

I. Claims **1-19** have been rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for electrochemical plating methods, does not reasonably provide enablement for electroless plating methods. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to carry out the invention the invention commensurate in scope with these claims.

The rejection of claims 1-19 under 35 U.S.C. 112, first paragraph, has been withdrawn in view of Applicants' amendment.

II. Claims **1-2, 5-7, 10-12, 15-18 and 29-30** have been rejected under 35 U.S.C. 112, first paragraph, because the specification, while being enabling for electroplating copper, does not reasonably provide enablement for electroplating gold. The specification does not enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to carry out the invention commensurate in scope with these claims.

The rejection of claims 1-2, 5-7, 10-12, 15-18 and 29-30 has been withdrawn in view of Applicants' remarks.

III. Claims **1-28 and 37** have been rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The rejection of claim 1-28 and 37 under 35 U.S.C. 112, second paragraph, has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 102

I. Claim **1** has been rejected under 35 U.S.C. 102(b) as being anticipated by **Feldstein** (US Patent No. 4,282,271).

The rejection of claim 1 under 35 U.S.C. 102(b) as being anticipated by Feldstein has been withdrawn in view of Applicants' amendment.

II. Claims **11 and 13-14** have been rejected under 35 U.S.C. 102(b) as being anticipated by **EP 402,896**.

The rejection of claims 11 and 13-14 under 35 U.S.C. 102(b) as being anticipated by EP 402,896 has been withdrawn in view of Applicants' amendment.

III. Claims **1 and 3-4** have been rejected under 35 U.S.C. 102(e) as being

anticipated by **Naoi et al.** (US Patent Application Publication No. 2003/0059634).

The rejection of claims 1 and 3-4 under 35 U.S.C. 102(e) as being anticipated by Naoi et al. has been withdrawn in view of Applicants' amendment.

IV. Claims **11 and 13-15** have been rejected under 35 U.S.C. 102(e) as being anticipated by **Naoi et al.** (US Patent Application Publication No. 2003/0059634).

The rejection of claims 11 and 13-15 under 35 U.S.C. 102(e) as being anticipated by Naoi et al. has been withdrawn in view of Applicants' amendment.

V. Claims **20-22 and 28** have been rejected under 35 U.S.C. 102(b) as being anticipated by **EP 402,896**.

The rejection of claims 20-22 and 28 under 35 U.S.C. 102(b) as being anticipated by EP 402,896 has been withdrawn in view of Applicants' amendment.

VI. Claims **20, 22, 25 and 28** have been rejected under 35 U.S.C. 102(e) as being anticipated by **Naoi et al.** (US Patent Application Publication No. 2003/0059634).

The rejection of claims 20, 22, 25 and 28 under 35 U.S.C. 102(e) as being anticipated by Naoi et al. has been withdrawn in view of Applicants' amendment.

Claim Rejections - 35 USC § 103

I. Claims **2-4, 7 and 10** have been rejected under 35 U.S.C. 103(a) as being

unpatentable over **Feldstein** (US Patent No. 4,282,271) as applied to claim 1 above.

The rejection of claims 2-4, 7 and 10 under 35 U.S.C. 103(a) as being unpatentable over Feldstein as applied to claim 1 above has been withdrawn in view of Applicants' amendment.

II. Claim **12** has been rejected under 35 U.S.C. 103(a) as being unpatentable over **EP 402,896** as applied to claims 11 and 13-14 above.

The rejection of claim 12 under 35 U.S.C. 103(a) as being unpatentable over EP 402,896 as applied to claims 11 and 13-14 above has been withdrawn in view of Applicants' amendment.

III. Claims **7 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634) as applied to claims 1 and 3-4 above.

The rejection of claims 7 and 10 under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. as applied to claims 1 and 3-4 above has been withdrawn in view of Applicants' amendment.

IV. Claims **12 and 16** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634) as applied to claims 11 and 13-15 above.

The rejection of claims 12 and 16 under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. as applied to claims 11 and 13-15 above has been withdrawn in view of Applicants' amendment.

V. Claims **29-32** have been rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634).

With respect to claim 30, the rejection under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. has been withdrawn in view of Applicants' remarks.

With respect to claims 29, 31 and 32, the rejection under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. is as applied in the Office Action dated June 9, 2003 and incorporated herein. The rejection has been maintained for the following reasons:

Applicants state that Naoi et al. does not teach, show or suggest a method for reducing degraded organic plating additives in an electrochemical plating solution, comprising adding sodium stannate to the electrochemical plating solution, the sodium stannate being added in an amount corresponding to a time varying amount of degraded organic plating additives generated in the electrochemical plating solution. In response, there is no requirement that the motivation to make the combination be expressly articulated in one or more of the references. The teaching, suggestion or inference can be found not only in the references but also from knowledge generally available to one of ordinary skill in the art. *Ashland Oil v. Delta Resins* 227 USPQ 657

(CAFC 1985).

The general knowledge of one having ordinary skill in the art would have been to replenish the amount of sodium stannate in the solution that is depleted in the plating process. This would have kept the bath at an optimum performance level during the plating process.

The reason or motivation to modify the reference may often suggest what the inventor has done, but for a different purpose or to solve a different problem. It is not necessary that the prior art suggest the combination to achieve the same advantage or result discovered by the Applicants. *In re Linter* 458 F 2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* 919 F 2d 688, 16 USPQ 2d 1897 (Fed. Cir. 1990), cert. denied, 500 USPQ 904 (1991); *In re Linter* 458 F 2d 1013, 173 USPQ 560 (CCPA 1972); *In re Dillon* 919 F 2d 688, 16 USPQ 2d 1897 (Fed. Cir. 1990), cert. denied, 500 USPQ 904 (1991) and MPEP § 2144.

VI. Claims **35-36 and 40** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634).

The rejection of claims 35-36 and 40 under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. has been withdrawn in view of Applicants' amendment. Claims 35-36 and 40 have been cancelled.

VII. Claims **23 and 24** are rejected under 35 U.S.C. 103(a) as being unpatentable

over **EP 402,896** as applied to claims 20-22 and 28 above.

The rejection of claims 23 and 24 under 35 U.S.C. 103(a) as being unpatentable over EP 402,896 as applied to claims 20-22 and 28 above has been withdrawn in view of Applicants' amendment.

VIII. Claims **21 and 26** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634) as applied to claims 20, 22, 25 and 28 above.

The rejection of claims 21 and 26 under 35 U.S.C. 103(a) as being unpatentable over Naoi et al. as applied to claims 20, 22, 25 and 28 above has been withdrawn in view of Applicants' amendment.

Response to Amendment

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

I. Claims **1 and 4-6** are rejected under 35 U.S.C. 102(e) as being anticipated by

Gabe et al. (US Patent Application Publication No. 2003/0102226 A1).

Gabe teaches a method for plating metal on a substrate, comprising the steps of:

(a) providing a plating solution comprising:

- (i) metal ions (page 4, ¶ [0045] and [0058]);
- (ii) an acid (= inorganic acid) [page 6, ¶ [0056]];
- (iii) halide ions (page 6, ¶ [0059]);
- (iv) one or more organic additives configured to enhance one or more plating characteristics (= brighteners, levelers, wetting agents, and etc.) [pages 5-6, ¶ [0054] to [0056]];
- (v) an at least one anti-oxidant selected from the group consisting of sodium stannate, hydroquinone butylated hydroxy toluene and combinations thereof (= hydroquinone) [page 4, ¶ [0041]], wherein the anti-oxidant has a concentration between about 500 ppm and 5000 ppm (= from about 0.001 g/l to about 100 g/l = 1 ppm to 100,000 ppm) [page 5, ¶ [0046]]; and

(b) contacting a substrate (page 8, ¶ [0072]) having an electrical bias with the plating solution to deposit a metal thereon (page 7, ¶ [0065]).

The metal ions comprise copper ions in a concentration of between about 5 g/l and about 100 g/l (= from about 0.010 g/l to about 200 g/l) [page 6, ¶ [0058] and [0060]].

The acid has a concentration of between about 5 g/l and about 200 g/l (= 15 to 500 g/l) [page 6, ¶ [0060]].

The halide ions comprise chloride ions in a concentration of between about 10 ppm and about 200 ppm (= from 0 mg/l to about 1 g/l = 0 ppm to 1,000 ppm) [page 6, ¶ [0059]].

The at least one organic plating additive comprises at least one of a leveler, a suppressor and an accelerator (pages 5-6, ¶ [0054] to [0056]).

II. Claims **11 and 13-14** are rejected under 35 U.S.C. 102(e) as being anticipated by **Gabe et al.** (US Patent Application Publication No. 2003/0102226 A1).

Gabe is as applied for the same reasons as discussed above and incorporated herein.

Gabe also teaches electroplating the metal ions from the plating solution onto the substrate (page 7, ¶ [0065]).

III. Claims **20-24 and 28** are rejected under 35 U.S.C. 102(e) as being anticipated by **Gabe et al.** (US Patent Application Publication No. 2003/0102226 A1).

Gabe is as applied for the same reasons as discussed above and incorporated herein.

Gabe also teaches wherein the liquid solution comprises copper sulfate (page 6, ¶ [0060]).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

I. Claims **7 and 10** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Gabe et al.** (US Patent Application Publication No. 2003/0102226 A1) as applied to claims 1 and 4-6 above.

Gabe is as applied above and incorporated herein.

Gabe does not teach wherein the amount of anti-oxidant added into the plating solution per unit time is calculated to correspond to an amount of organic additives degrading on the plating solution per unit time; and disposing of the entire plating solution after a period of time and replacing the plating solution.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the method of Gabe with wherein the amount of anti-oxidant added into the plating solution per unit time is calculated to correspond to an amount of organic additives degrading on the plating solution per unit time because Gabe teaches that adding one or more of the alcohol compounds to the

metal plating baths prevents or reduces the degradation of the metal plating bath (page 5, ¶ [0046]). The metal plating bath **14** is directed continuously to a second container or reservoir **22** by transporting means such as a pump. Reservoir **22**, which metal plating bath flows through replenishes metal bath components and additives in the metal plating bath **14** such as copper salts, brighteners, levelers, additive consumption inhibiting alcohols and the like (page 7, ¶ [0068]; and Fig. 1). Thus, an amount of anti-oxidant would have been added into the plating solution per unit time calculated to correspond to an amount of organic additives degrading on the plating solution per unit time.

As to disposing of the entire plating solution after a period of time and replacing the plating solution, it is well within the skill of the artisan to discard the used plating solution and replace it with a new one. It appears that a plating solution would have a certain lifetime, and after that, it would need to have been replaced.

II. Claim **12** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Gabe et al.** (US Patent Application Publication No. 2003/0102226 A1) as applied to claims 11 and 13-14 above.

Gabe is as applied above and incorporated herein.

Gabe does not teach disposing of the entire plating solution after a period of time

and replacing the plating solution.

However, the invention as a whole would have been obvious to one having ordinary skill in the art at the time the invention was made because one skilled in the art would have been motivated to have modified the method of Gabe by disposing of the entire plating solution after a period of time and replacing the plating solution because it is well within the skill of the artisan to discard the used plating solution and replace it with a new one. It appears that a plating solution would have a certain lifetime, and after that, it would need to have been replaced.

III. Claim **33** is rejected under 35 U.S.C. 103(a) as being unpatentable over **Naoi et al.** (US Patent Application Publication No. 2003/0059634) as applied to claims 29, 31 and 32 above.

Naoi is as applied above and incorporated herein.

Naoi also teaches wherein the electrochemical plating solution includes an acid (= amidosulfonic acid) in a concentration of between about 5 g/l and about 200 g/l (= 10 g/l) [page 11, ¶ [0199]].

Allowable Subject Matter

The following is a statement of reasons for the indication of allowable subject

matter:

Claims **8 and 9** define over the prior art of record because the prior art does not teach or suggest the method of claim 1, wherein the plating solution comprises copper ions, the acid, chloride ions, sodium stannate and at least one organic plating additive as presently claimed.

Claims **16-18** define over the prior art of record because the prior art does not teach or suggest the method of claim 11, wherein the at least one anti-oxidant is sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

Claim **19** defines over the prior art of record because the prior art does not teach or suggest the method of claim 11, wherein the plating solution comprises copper ions, the acid, chloride ions and sodium stannate as presently claimed.

Claim **26** defines over the prior art of record because the prior art does not teach or suggest the plating solution of claim 22, wherein the anti-oxidant is sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

Claim **27** defines over the prior art of record because the prior art does not teach or suggest the plating solution of claim 20, further comprising the copper ions, the acid, chloride ions and sodium stannate as presently claimed.

Claim **30** defines over the prior art of record because the prior art does not teach or suggest the method of claim 29, wherein the concentration of sodium stannate is between about 500 ppm and about 5000 ppm.

Claim **34** defines over the prior art of record because the prior art does not teach

or suggest the method of claim 31, wherein the plating solution includes chloride ions in a concentration of between about 10 ppm and about 200 ppm.

The prior art does not contain any language that teaches or suggests the above.

Naoi et al. do not teach sodium stannate at a concentration of between about 500 ppm and about 5000 ppm; and chloride ions.

Gabe et al. do not teach sodium stannate at a concentration of between about 500 ppm and about 5000 ppm.

Therefore, a person skilled in the art would not have been motivated to adopt the above conditions, and a prima facie case of obviousness cannot be established.

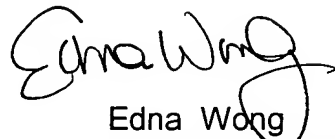
Claims 8-9, 16-19, 26-27, 30 and 34 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Edna Wong whose telephone number is (703) 308-3818. The examiner can normally be reached on Mon-Fri 7:30 am to 5:00 pm, alt. Fridays off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306.

Any inquiry of a general nature or relating to the status of this application or

proceeding should be directed to the receptionist whose telephone number is (703) 308-1495.

A handwritten signature in black ink, appearing to read "Edna Wong". The signature is fluid and cursive, with the first name "Edna" and last name "Wong" clearly distinguishable.

Edna Wong
Primary Examiner
Art Unit 1753

EW
October 6, 2003